



Sungkyunkwan University (SKKU) International Summer Semester (ISS) 2018

How the Mind Works – a Big Data Approach

Prof. Dr. David T. Reitter, The Pennsylvania State University

SHORT COURSE DESCRIPTION

Cognitive Science is the study of the mind; how we perceive the world, remember, reason, think, learn and communicate. To study the mind, cognitive psychologists use methods including laboratory experiments, computational models, brain imaging, statistical modeling of existing datasets, and studying the effects of brain damage. We will discuss all of these approaches during the course, learning about key theories and research findings that have emerged from the field of Cognitive Science. After successfully completing the course, you should be able to:

1. Relate key research findings to cognitive theories
2. Understand research methods in cognitive psychology, their strengths and weaknesses
3. Describe current issues in cognitive science research
4. Explain some of the broader implications of findings from cognitive science

More generally, the course will teach you understand and critique scientific ideas, and apply these critical facilities to the ideas and information you encounter in your professional life.

ABOUT YOUR INSTRUCTOR

Professor **David Reitter** (reitter@psu.edu) is your instructor for this course. He is an Assistant Professor of Information Science and Technology at Penn State, holds a PhD from the University of Edinburgh, and was a post-doctoral fellow at Carnegie Mellon University. His research helps us understand how the mind produces and comprehends natural language, and how we can use this knowledge to revolutionize artificial intelligence. Reitter co-directs the Applied Cognitive Science lab at Penn State. Dr. Reitter's work is funded by the National Science Foundation. He is also the creator of the widely popular *Aquamacs* software.



READING MATERIALS

The lectures provide the core content of the course, introducing key theories and research findings. The information is supplemented by readings from the textbook, and by other articles included in the homework assignments. Articles associated with the homework assignments will be available to download from the website. Not all material in the readings will be covered in the lecture, and vice versa, so it is important to keep up with both.

Text book: John R. Anderson: *Cognitive Psychology and its implications*. (To be read during class.)

COURSE REQUIREMENTS AND GRADING

After each class, you need to fill out a "log entry". This is your diary for this semester. You may reflect on what was discussed in the lecture, relate it to personal experience or research results you are aware of, and you may provide feedback on what you liked or disliked in class. There will be a mid-term and a final exam, which will contain a mix of multiple-choice and essay questions. All answers must be given in English. The final grade is figured as 60% mini-exam results, 30% in-class presentation (if given), and 10% participation. This weighting is subject to adjustment. Grounds for failing the class include failure to reach at least 60% in grades; failure to show up for most classes, or for the exams, and academic dishonesty.

COURSE SCHEDULE

This schedule is subject to (minor) changes. The following lists the topics we will be discussing in order. For the dates, particularly due dates of homework assignments, refer to the course calendar available in spreadsheet form from the website.

– WEEK I –

Introduction: What is Cognitive Science?

Module 1: Methods, Theories, and Perception

Behavioral and Neurological Research Methods

Classic Theories, Levels of analysis - Modeling

Eye& Brain, Faces

Optical Illusions

– WEEK II –

Neuroscience and vision: Dorsal and Ventral pathways

Synesthesia/Review

Module 2: Attention

Attention & Perception, Selective Attention

Early or Late Selection

Multi-Tasking

Proceduralization (and expertise-building)

Planning and Control

Problem-Solving and how experts do it

Inhibition

– WEEK III –

Module 3: Memory

Models of Memory / Working Memory

Capacity, Encoding, Amnesia

Explicit/Implicit Knowledge

Procedural Knowledge, Review

Rational Analysis and inference of memory properties from big data

– WEEK IV –

Module 4: Language and Higher Cognition

What is language? Words and Sentences

Language Acquisition

Language modeling using large text and speech corpora

Decision-Making, Experimental Game Theory

Cognitive Biases, Review